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**E7.3 10524**

**CR-131491**

DETERMINATION OF AEROSOL CONTENT  
IN THE ATMOSPHERE FROM  
ERTS-1 DATA

(E73-10524) DETERMINATION OF AEROSOL  
CONTENT IN THE ATMOSPHERE FROM ERTS-1  
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May 1973 (Science Applications, Inc.)  
11 p

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Progress Report No. 4

Contract No.: NAS5-21860

Period Covered: 7 March 1972 to 6 May 1973

Proposal Number: 245

GSFC ID Number: P135

Principal Investigator: Dr. M. Griggs

SCIENCE APPLICATIONS, INCORPORATED

P.O. BOX 2351, 1250 PROSPECT ST., LA JOLLA, CALIFORNIA 92037



Prepared for:

Goddard Space Flight Center

7 May 1973

## ACCOMPLISHMENTS

During the fourth two-month period of this contract data analysis, now using the computer compatible tapes, was continued. Ground-truth measurements were made at the Salton Sea test site.

## GROUND-TRUTH MEASUREMENTS

The previous report stated that considerable cloud cover existed at the time of the NASA aircraft overflight at the Salton Sea/desert test site on February 4, 1973. The ERTS photographs since received have confirmed that the test-site was almost totally covered with high cloud so that no data useful for this investigation could be obtained from either the satellite or the aircraft measurements. A definite data for another NASA aircraft overflight has not yet been scheduled by Houston.

The photographic aircraft MSS data for one channel were received from Houston in March. On the basis of examining these data, and the satellite data analysis to date, the requirements for NASA aircraft support have been revised. The target area to be covered by the aircraft has been approximately halved, and the number of spectral channels reduced by four, eliminating coverage of MSS 7 which is not useful for this investigation due to atmospheric water vapor.

Ground-based observations of the aerosol optical thickness with the Volz photometer have been made twice at the Salton Sea coinciding with ERTS-1 overpasses. These measurements are shown in Fig. 1 with previous Volz data. No measurements were made in this reporting period at San Diego due to cloud cover at the time of the ERTS-1 overpasses.

## DATA ANALYSIS

### Photographic Data Analysis

The previous report discussed the problem with the grey-scale calibration at high densities (low radiance). This is due to the inherent inaccuracies in producing the photographic images. This is a severe problem in this investigation since we are particularly concerned with the low radiances over water surfaces. Hence, densitometric analysis of the transparencies has been discontinued in this investigation; all future analysis will use the digital data on the CCT.

### Software Development

The program to read data from the CCT is prescribed geographical areas has been completed and successfully used on actual ERTS-1 data.

### Digital Data Analysis

The digital data for three overpasses for the Salton Sea/desert test site have been printed out and a preliminary analysis made. The data are more consistent than the photographic data as expected.

To analyze the data, an area, about 1000 x 1000 ft, is selected on the Salton Sea and on the desert. The water area is selected away from the shoreline where the radiance is essentially uniform within the area. The desert area is selected for high radiance and uniformity. An average radiance for each area is estimated for each MSS band. Of course, we did not plan on using MSS7 due to the atmospheric water vapor effect; in any case it would not be useful over water surfaces due to the very low (counts 0, 1, 2) and inaccurate radiance values.

The spectral variations of the radiance over the desert and Salton Sea are shown in Fig. 2 and 3. The desert radiance increases with decreasing wavelength and with sun elevation. The radiance for two areas (2-1) and (3-1) for 10-1-72 show different variations at the shorter wavelengths, although the difference is within the data errors. The water radiance, as expected, shows a sharp decrease as the wavelength increases. For 11-6-72 it was found that the radiance near the shoreline was higher than in the center of the sea, as shown by the two curves for this date. It was necessary to go 1300 ft from the shoreline to obtain constant radiance values. However, this effect was not apparent on the other two dates analyzed. Further investigation of this effect is necessary. If the data for 11-6-72 close to the shoreline are ignored, then the water radiance increases with increasing sun elevation.

Preliminary use of these data to investigate the contrast relationship are not consistent as a function of wavelength, indicating that the theoretical relationship, as expected, must be modified, and will be discussed in the next reporting period.

#### Future Plans

In the next reporting period it is planned to continue analysis of the digital data to investigate both the contrast and radiance relationships.

#### Significant Results

There are no significant results to report in this period.

#### Data Requests

Digital data for seven more sets of data (two at San Diego and five at the Salton Sea) have been requested. In addition, a replacement set for

one previously received was requested since numerous parity errors on the tape prevented our obtaining data from it. Copies of the Data Request Forms are included at the end of this report.

#### Standing Order Change

A change in our Standing Order was made to extend the coverage period to 9-30-73, to obtain the maximum data for the duration of the contract, and to increase the acceptable cloud cover to 60%. A copy of the form is included at the end of this report.

#### Presentation

A paper, "Determination of Aerosol Content in the Atmosphere," discussing the results of this study was presented at the ERTS-1 Symposium by M. Griggs in Washington, D. C. in March. Many requests for a copy of this paper have been received.

#### Miscellaneous

M. Griggs visited R. F. Fraser at Goddard in March to discuss the results and status of the investigation.

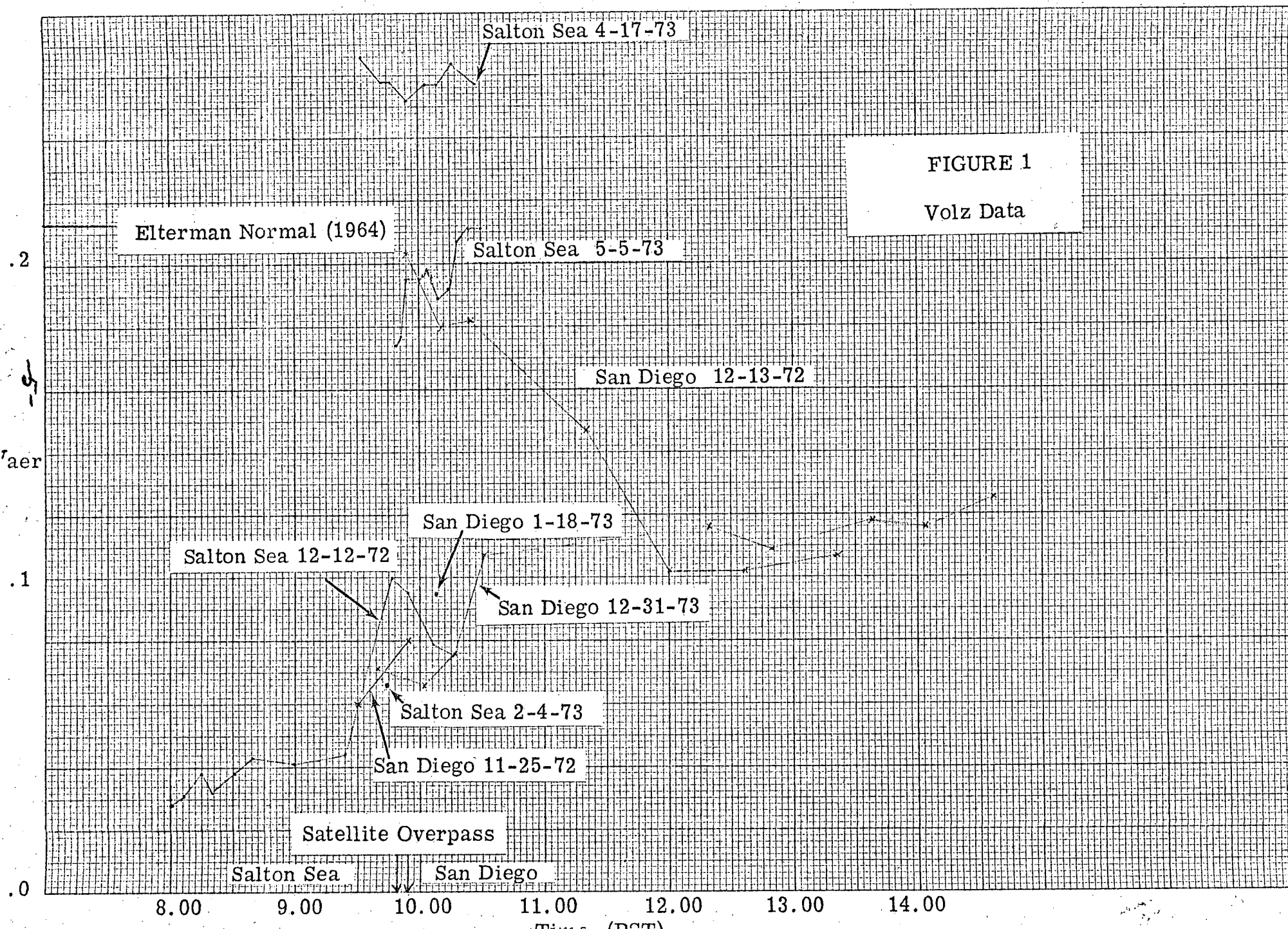


Fig. 2 Desert Radiance

Radiance ( $\text{mw}/\text{cm}^2/\mu/\text{sr}$ )

20

10

(2-1) 10-1-72

(3-1) 10-1-72

(3-2) 11-6-72

(3-1) 12-12-72

Sun Elevation

46°

35°

28°

0

.4

.5

.6

.7

.8

.9

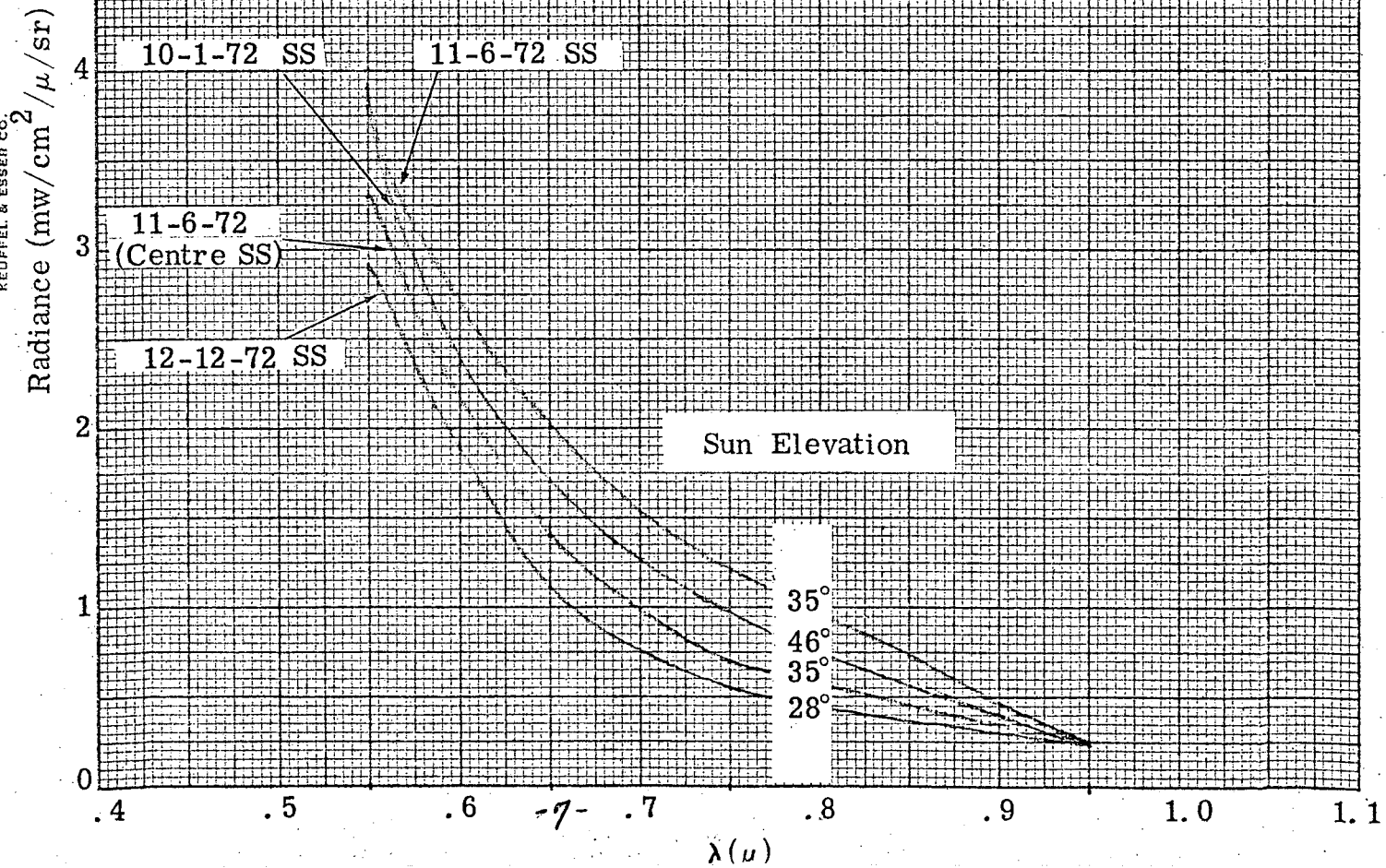
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$\lambda(\mu)$



Fig. 3 Water Radiance





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52-17495	N33-07/ W115-58	M	D	7		1	U
78-17501	N33-48/ W115-43	M	D	7		1	U
24-17504	N33-07/ W116-00	M	D	7		1	U
179-17561	N33-17/ W117-20	M	D	7		1	U
160-17503	N33-11/ W115-58	M	D	7		1	U
034-17500	N33-02/ W116-01	M	D	7		1	U

-8-

# DATA REQUEST FORM

NDPF USE ONLY

D \_\_\_\_\_  
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1. DATE April 26th 1973

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161-17561	N 33-08/ W 117-23	M	D	7		1	U
This tape was previously requested and received. However, numerous parity errors on the tape prevented our obtaining data from it.							

(See Instructions on Back)

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